

Claims

1. A process for manufacturing of paper, in which a filler is pre-treated and suspended to form an aqueous slurry, the aqueous slurry obtained is combined with an aqueous suspension containing cellulose fibres to form a stock, the stock
5 obtained is treated at least with a cationic retention agent, and the treated stock is filtered and dried in the form of paper, **characterised** in that the filler is pre-treated with inorganic colloidal particles having an average particle size in water less than 100 nm.
- 10 2. A process as defined in claim 1, **characterised** in that the filler is treated with inorganic colloidal particles so that the surface of the filler particles will at least partly consist of inorganic colloidal particles.
- 15 3. A process as defined in claim 1 or 2, **characterised** in that the filler is pre-treated with inorganic anionic colloidal particles.
4. A process as defined in claim 3, **characterised** in that the anionic colloidal particles consist of synthetic silicate and/or hectorite.
- 20 5. A process as defined in claim 3, **characterised** in that the anionic colloidal particles consist of smectite or montmorillonite-based (bentonite)silicate.
6. A process as defined in claim 3, **characterised** in that the anionic colloidal particles consist of colloidal silica sol and/or polysilicic acid.
- 25 7. A process as defined in claim 3 or 4, **characterised** in that the anionic colloidal particles consist of colloidal metal silicate pertaining to synthetic silicates and having preferably magnesium as the predominant cation.
8. A process as defined in any of the preceding claims, **characterised** in that the inorganic colloidal particles have an average particle diameter in the range of 1-80 nm, preferably in the range of 1-50 nm, most advantageously in the range of
30 1-25 nm.
9. A process as defined in any of the preceding claims, **characterised** in that the powder formed of inorganic colloidal particles has a specific area (BET) in the range of 30-1,000 m²/g, preferably in the range of 100-1,000 m²/g.

10. A process as defined in any of the preceding claims, **characterised** in that the filler is pre-treated with inorganic colloidal particles in an amount varying in the range of 50-10,000 g/t, preferably in the range of 500-5,000 g/t, calculated on the total amount of dry filler.
- 5 11. A process as defined in any of the preceding claims, **characterised** in that the entire filler amount intended for the stock is pre-treated with inorganic colloidal particles.
- 10 12. A process as defined in any of the preceding claims, **characterised** in that only a portion of the filler amount intended for the stock is pre-treated with inorganic colloidal particles, while the other portion preferably is in an aqueous suspension of cellulose.
- 15 13. A process as defined in claim 12, **characterised** in that the weight proportion of inorganic colloidal particles in the total weight of these particles and the pre-treated portion of filler amount is in the range of 0.5-20 kg/t, preferably in the range of 1-10 kg/t.
14. A process as defined in any of the preceding claims, **characterised** in that the filler is treated by combining a slurry or a sol of inorganic colloidal particles and a filler slurry.
- 20 15. A process as defined in claim 14, **characterised** in that the slurry or sol of inorganic colloidal particles has a concentration of 0.5-30%, preferably 1-10%.
16. A process as defined in any of the preceding claims, **characterised** in that the filler is an inorganic particulate substance.
- 25 17. A process as defined in claim 16, **characterised** in that the inorganic particulate substances is selected in the group comprising kaolin, calcinated kaolin, calcium carbonate, talcum, titanium dioxide, calcium sulphate, synthetic silicate and aluminium hydroxide fillers and mixtures of these.
- 30 18. A process as defined in claim 17, **characterised** in that the inorganic particulate substance is titanium dioxide.
19. A process as defined in claim 18, **characterised** in that the titanium dioxide has an average particle diameter in the range of 150-350 nm, more advantageously approx. 200 nm.

20. A method as defined in any of the preceding claims, **characterised** in that the total amount of filler accounts for 10-60%, preferably 20-50%, of the total amount of the dry weight of the stock.
21. A method as defined in any of the preceding claims, **characterised** in that the aqueous filler slurry has a concentration of 5-70%, preferably 20-50%.
22. A method as defined in any of the preceding claims, **characterised** in that the cellulose of the aqueous suspension of cellulose originates from chemical, mechanical or chemo-mechanical pulp, recycled fibres or a mixture of these.
23. A method as defined in any of the preceding claims, **characterised** in that the aqueous suspension of cellulose has a consistency in the range of 1-50 g/l, preferably in the range of 5-15 g/l.
24. A method as defined in any of the preceding claims, **characterised** in that the aqueous slurry is combined with an aqueous suspension of cellulose to form a stock having a total consistency in the range of 3-20 g/l, preferably 5-15 g/l, most advantageously 7-13 g/l.
25. A method as defined in any of the preceding claims, **characterised** in that the cationic retention agent is a cationic polymer having a molecular weight of at least 500,000 g/mol, preferably at least 1,000,000 g/mol.
26. A method as defined in claim 25, **characterised** in that the cationic polymer is cationic starch or a copolymer of acrylamide and a cationic comonomer.
27. A method as defined in claim 26, **characterised** in that the copolymer of acrylamide and the cationic comonomer is a copolymer of acrylamide and acryloyloxyethyltrimethyl ammonium chloride having preferably a molecular weight above 500,000 g/mol.
28. A method as defined in any of claims 25-27, **characterised** in that the amount of cationic polymer is in the range of 25-10,000 g/t, preferably in the range of 50-1,000 g/t of dry matter of said stock.
29. A method as defined in any of the preceding claims, **characterised** in that the stock is treated with anionic colloidal particles, which may be identical to or different from said inorganic colloidal particles used for filler pre-treatment.

30. A method as defined in any of the preceding claims, **characterised** in that the stock is filtered through a steel wire having 100-300 mesh apertures to form paper.
- 5 31. A method as defined in any of the preceding claims, **characterised** in the use of other paper-improving agents, preferably other retention chemicals, size, dies and fibre binders.
- 10 32. A process for manufacturing of paper, in which titanium dioxide is pre-treated and suspended, the aqueous slurry obtained is combined with an aqueous suspension of cellulose to form a stock, the stock obtained is treated at least with a cationic retention agent and the treated stock is filtered and dried to form paper, **characterised** in that titanium dioxide is pre-treated with colloidal metal silicate pertaining to synthetic silicates and having magnesium as the predominant metal and an average particle diameter in the range of 1-25 nm.
- 15 33. Use of inorganic colloidal particles having an average particle size less than 100 nm in paper manufacturing for filler pre-treatment before addition of the filler into an aqueous suspension of cellulose.
34. Use as defined claim 33, in which the inorganic colloidal particles are anionic.